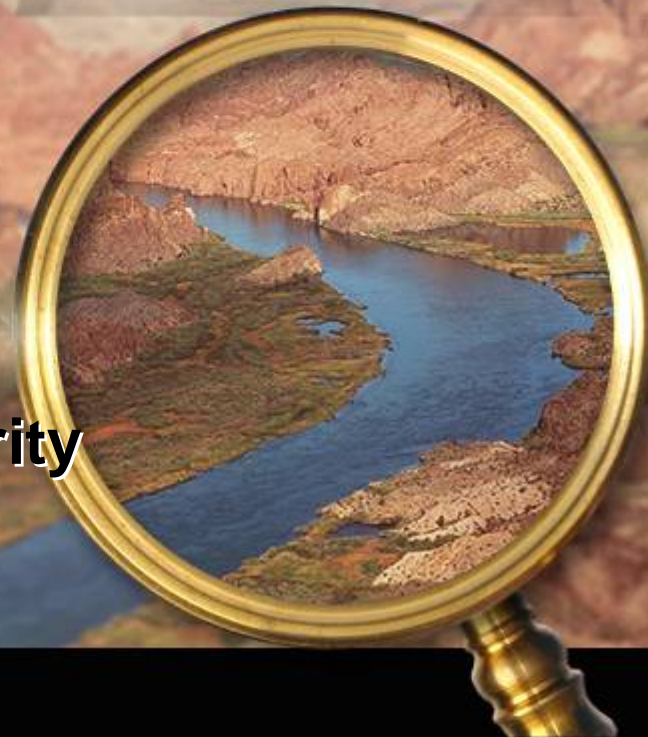


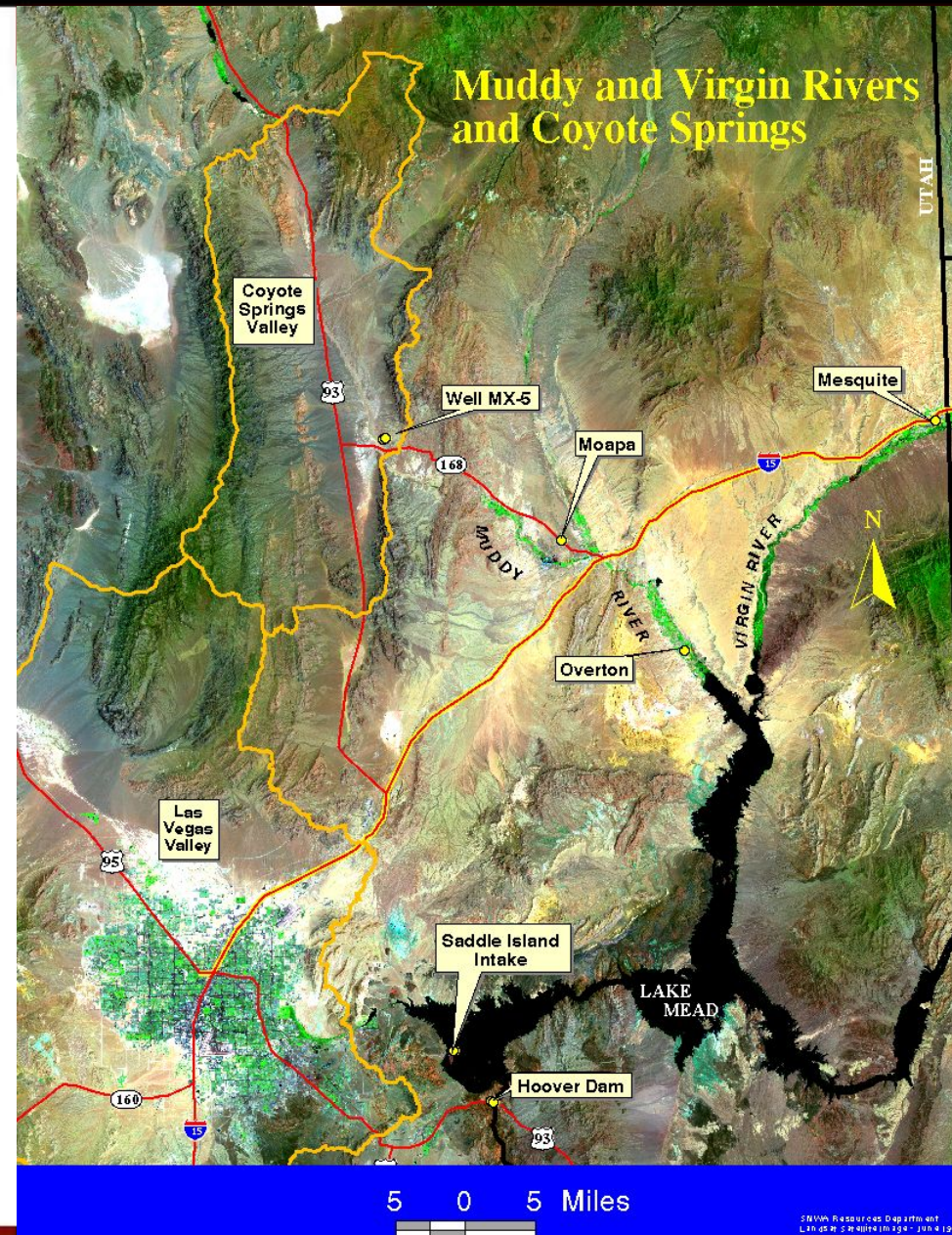
“Strategies for Augmenting the River”



Southern Nevada Water Authority
April 27, 2007
Jeff Johnson

Discussion

- Tributary conservation
- Non-Colorado River system conveyance
- System Augmentation





I spied it, so it's mine



What..., so I use 4.4 mafy



I got your shortage...

The States of Arizona, California, Colorado, Nevada,
New Mexico, Utah and Wyoming
Governor's Representatives on Colorado River Operations

February 3, 2006

Honorable Gale A. Norton, Secretary
Department of the Interior
1849 C. Street, NW
Washington, D.C. 20240

Re: Development of Lower Basin Shortage Guidelines and Coordinated Management
Strategies for the Operation of Lake Mead and Lake Powell Under Low Reservoir
Conditions

Dear Secretary Norton:

The materials attached to this letter contain descriptions of the programs that the seven Colorado River Basin States suggest be included within the scope of the environmental impact statement (EIS) for the proposed *Colorado River Reservoir Operations: Development of Lower Basin Shortage Guidelines and Coordinated Management Strategies for Lake Powell and Lake Mead Under Low Reservoir Conditions* (70 Fed. Reg. 57322) (Sept. 30, 2005).

The Basin States, Bureau of Reclamation and others have consulted regularly since our previous correspondence on August 25, 2005 to further discuss and refine recommended management strategies for the Colorado River system. Subsequently, individual entities within the seven Basin States submitted oral and written comments to the Bureau of Reclamation on the above referenced EIS process. Attachment A, "Seven Basin States' Preliminary Proposal Regarding Colorado River Interim Operations," is submitted as a consensus document on behalf of the seven Basin States. Please recognize that the States are still actively working on the matter addressed in this submission and anticipate further refinement.

Our recommendation is designed to provide input for the Department's consideration as it develops additional operational and water accounting procedures to: 1) delay the onset and minimize the extent and duration of shortages in the Lower Division States; 2) maximize the protection afforded the Upper Division States by storage in Lake Powell against possible curtailment of Upper Basin uses; 3) provide for more efficient, flexible, responsive and reliable operation of the system reservoirs for the benefit of both the Upper and Lower Basins by developing additional system water supplies through extraordinary conservation, system efficiency and augmentation projects; 4) allow the continued development and use of the Colorado River resource in both the Upper and Lower Basins; and 5) allow for development of dedicated water supplies through participation in improvements to system efficiency and

The "Basin States Alternative"

"...permit Contractors to purchase and fallow... water rights on tributaries within the Lower Division... [that pre-date] the Boulder Canyon Project Act... [which] contribute water to the Colorado River mainstream for diversion by the Contractor."

"...allow non-Colorado River System water in a Lower Division State to be introduced into, conveyed through, and diverted from [Colorado River] system reservoirs..."

Nevada In-State Resources

Opportunity / Strategy

Source & Amount of Water

Tributary Conservation

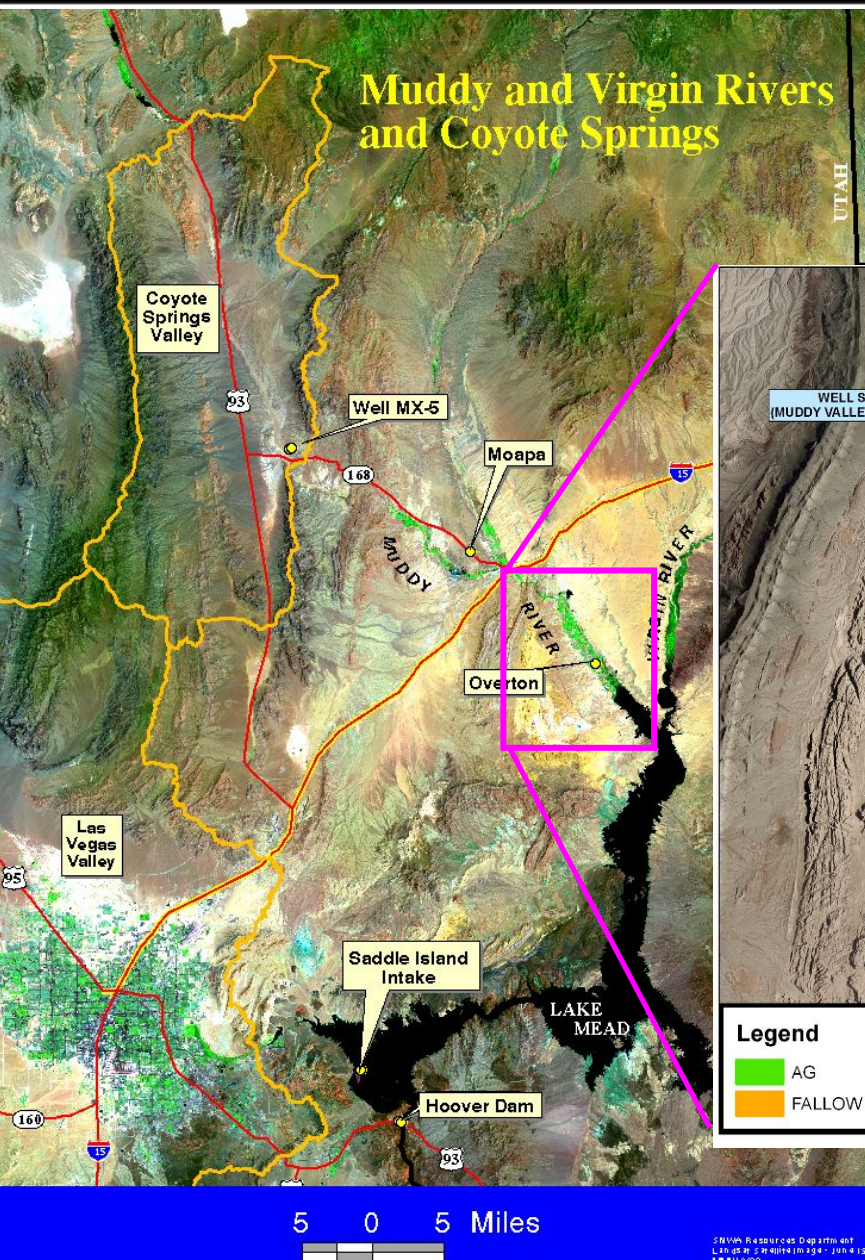
Virgin and Muddy Rivers

Up to 30,000 afy

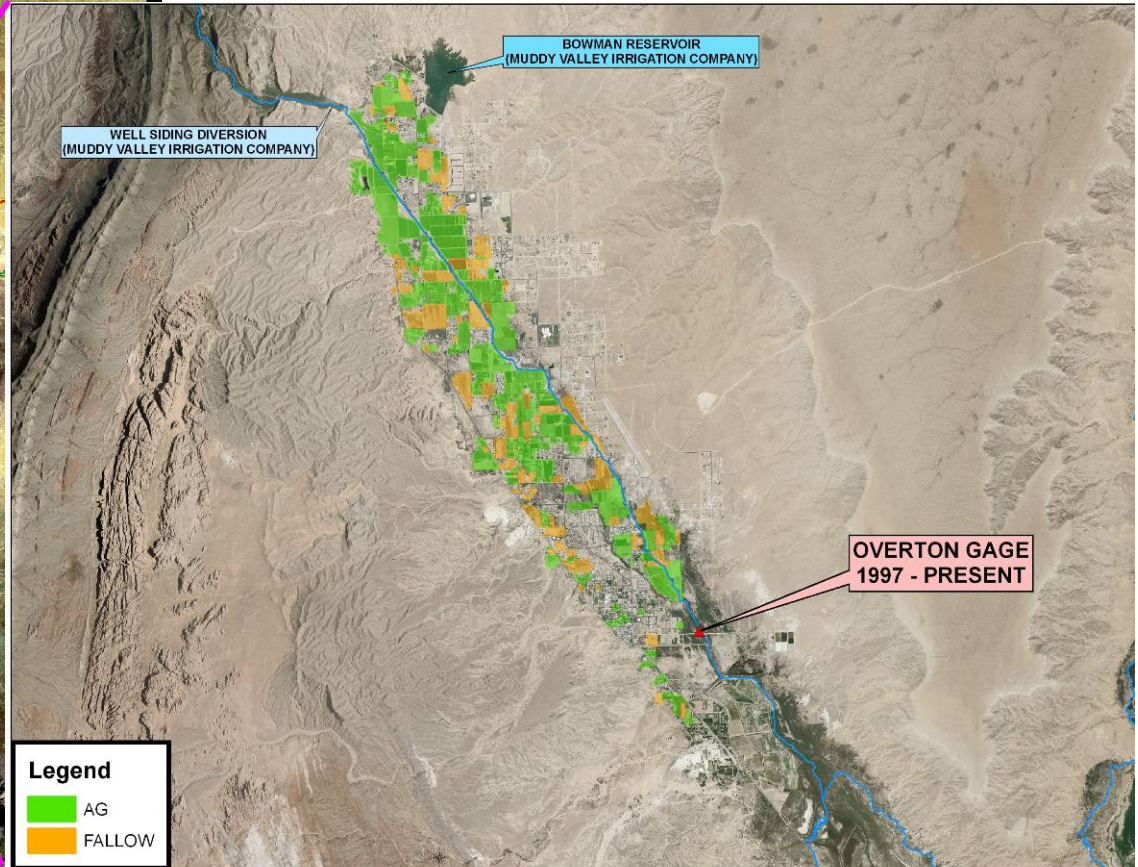
Introduction and Recovery of
Non- System Colorado River
Water

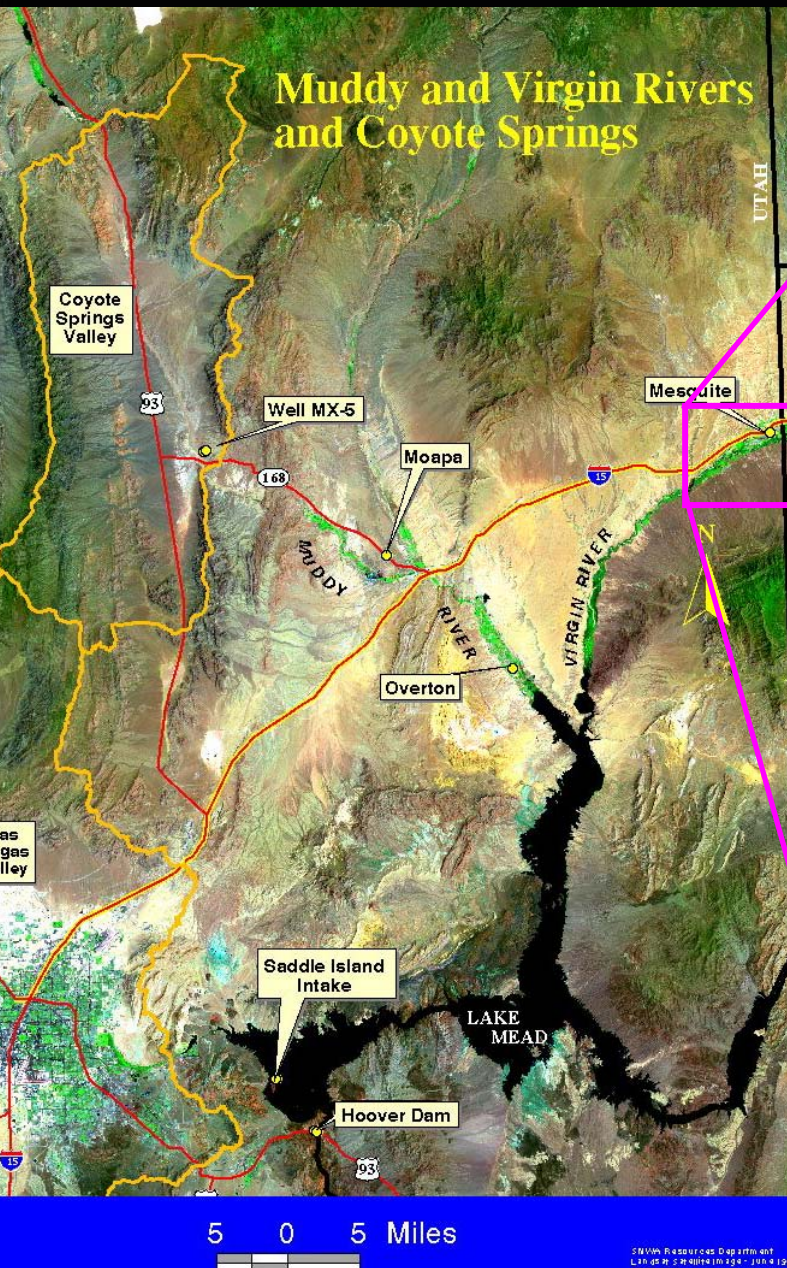
Coyote Spring Valley
Groundwater

Currently 9,000 afy

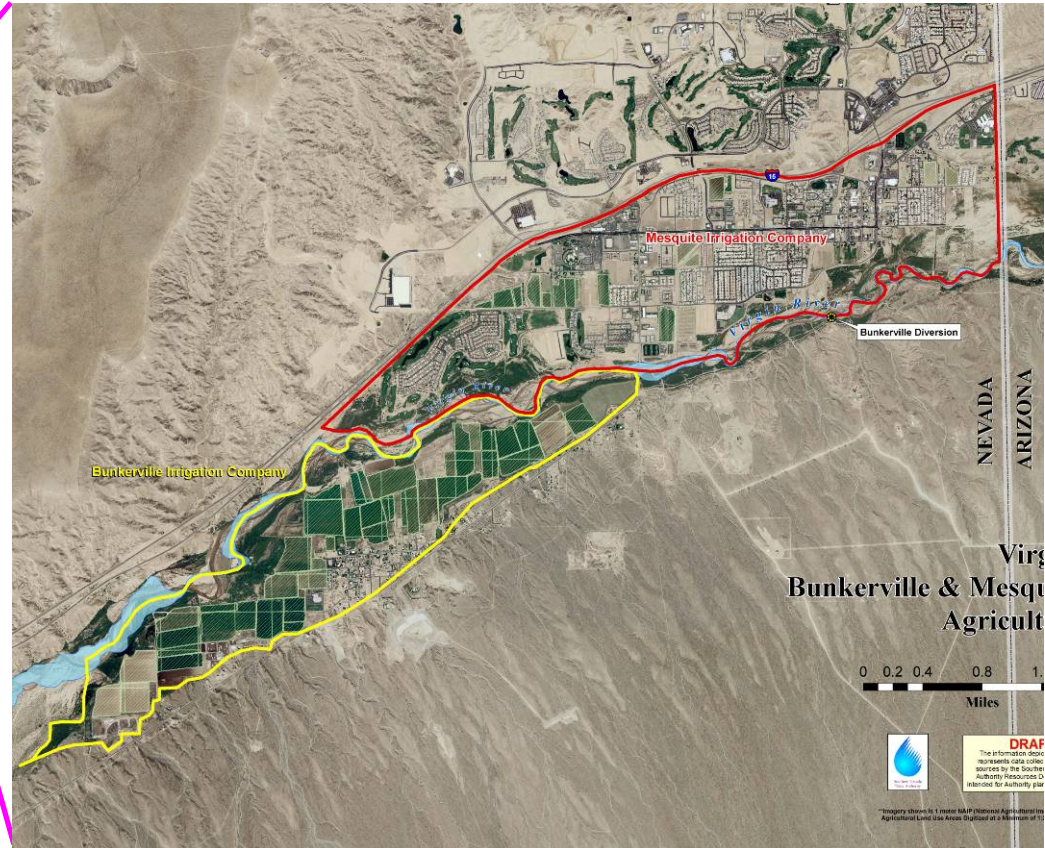


Lower Muddy River



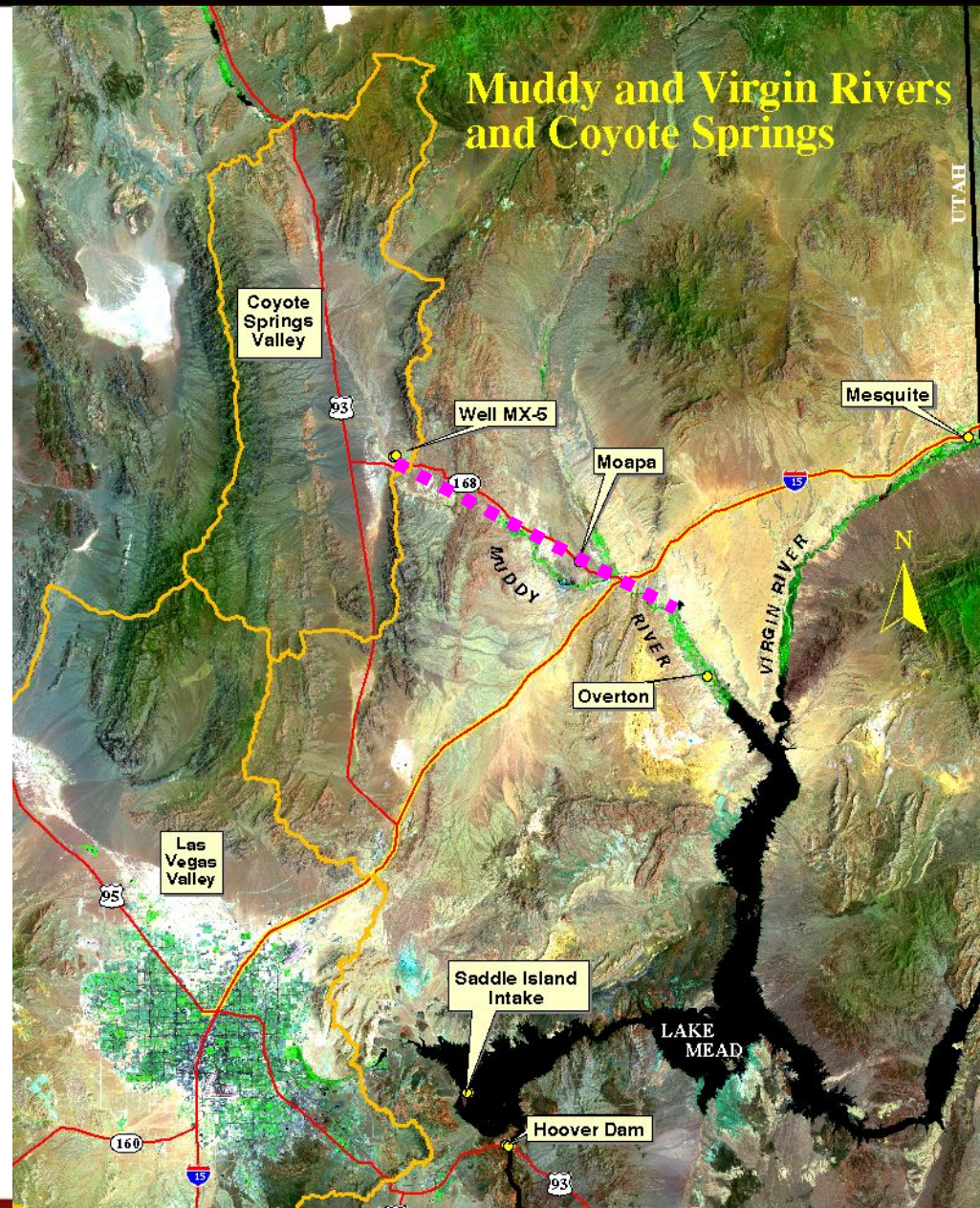


Virgin River



Coyote Spring Valley

- Groundwater Rights
 - SNWA 9,000 afy
- Pipeline Project
 - Complete mid 2009
 - Conveys SNWA's rights to Muddy River



Nevada In-State Resources

- Virgin River surface water rights
 - Up to 190,000 afy
 - 1994 priority rights
- Pipeline project to develop
- SNWA will not pursue development of the pipeline project so long as diligent pursuit of system augmentation is proceeding or has provided Nevada with an annual supply of 75,000 by 2020

The States of Arizona, California, Colorado, Nevada,
New Mexico, Utah and Wyoming
Governor's Representatives on Colorado River Operations

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The "Basin States Alternative"

"...The States will move forward with a package of other actions that include... a demonstration program for extraordinary conservation... system efficiency projects... [and] initiation of a study for long-term augmentation of Colorado River System water supplies."

The Objective of the Project

- Evaluate major options for augmenting the Colorado River supply:
 - Environmental
 - Costs
 - Overall feasibility
- Prepare summary report on results

“CRWC to provide the technical assessment of options ... the States will provide legal, administrative, or institutional considerations”

Colorado River Basin



Meetings with States Provided Information on Options

- Wyoming
- Colorado
- California
- Lower Colorado Region – Reclamation
- Nevada
- New Mexico
- Arizona
- Utah
- Upper Colorado Region – Reclamation

Twelve long-term augmentation concepts initially identified and 'white papers' prepared

- Brackish water desalination
- Coalbed methane produced water
- Conjunctive use
- Ocean water desalination
- Reduction of power plant consumptive use
- Reservoir evaporation control
- Stormwater storage
- River imports and exports
- Vegetation management
- Water imports using ocean routes
- Water reuse
- Weather modification

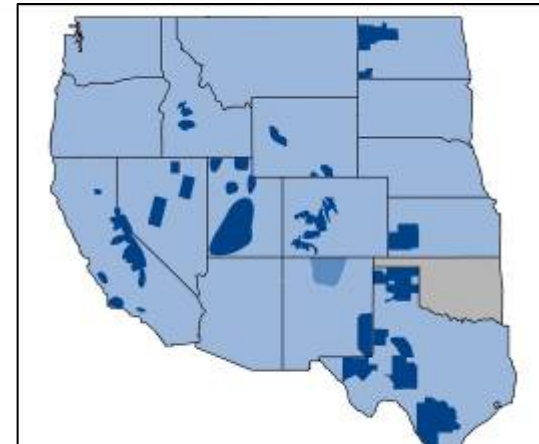
Options



Coalbed Methane Water



Water Imports – Ocean Routes



Weather Modification



Water Reuse



Power Plant Cooling

Reservoir Evaporation Control

Technical Memoranda drafted on Six Options Designated by Technical Committee

- Ocean Water Desalination
- Transbasin Imports
- Vegetation Management
- Brackish Water Desalination
- Conjunctive Use
- Stormwater Storage (Painted Rock Reservoir)

Summary of Technical Memoranda

Ocean Water
Desalination

Transbasin
Imports

Vegetation
Management

Brackish Water
Desalination

Conjunctive
Use

Stormwater
Storage



Ocean Water Desalination Concept

Desalt ocean water by reverse osmosis to drinking water standards and integrate into supply system.

Ocean Water Desalination General Description

- **Quantity:** 20,000 - 100,000 AFY (20 MGD–100 MGD)
- **Cost:** \$1,100 - \$1,600/AF
- Technology is proven and reliable
- Cost is high, but competitive
- Permitting is a challenge, but can be accomplished
- Advantage is that others lead the way

Summary of Technical Memoranda

Ocean Water Desalination
Transbasin Imports
Vegetation Management
Brackish Water Desalination
Conjunctive Use
Stormwater Storage



Transbasin Imports Location

Clarks Fork to Green River

Snake River to North Horse Creek

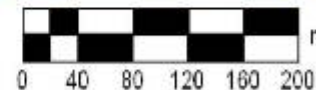
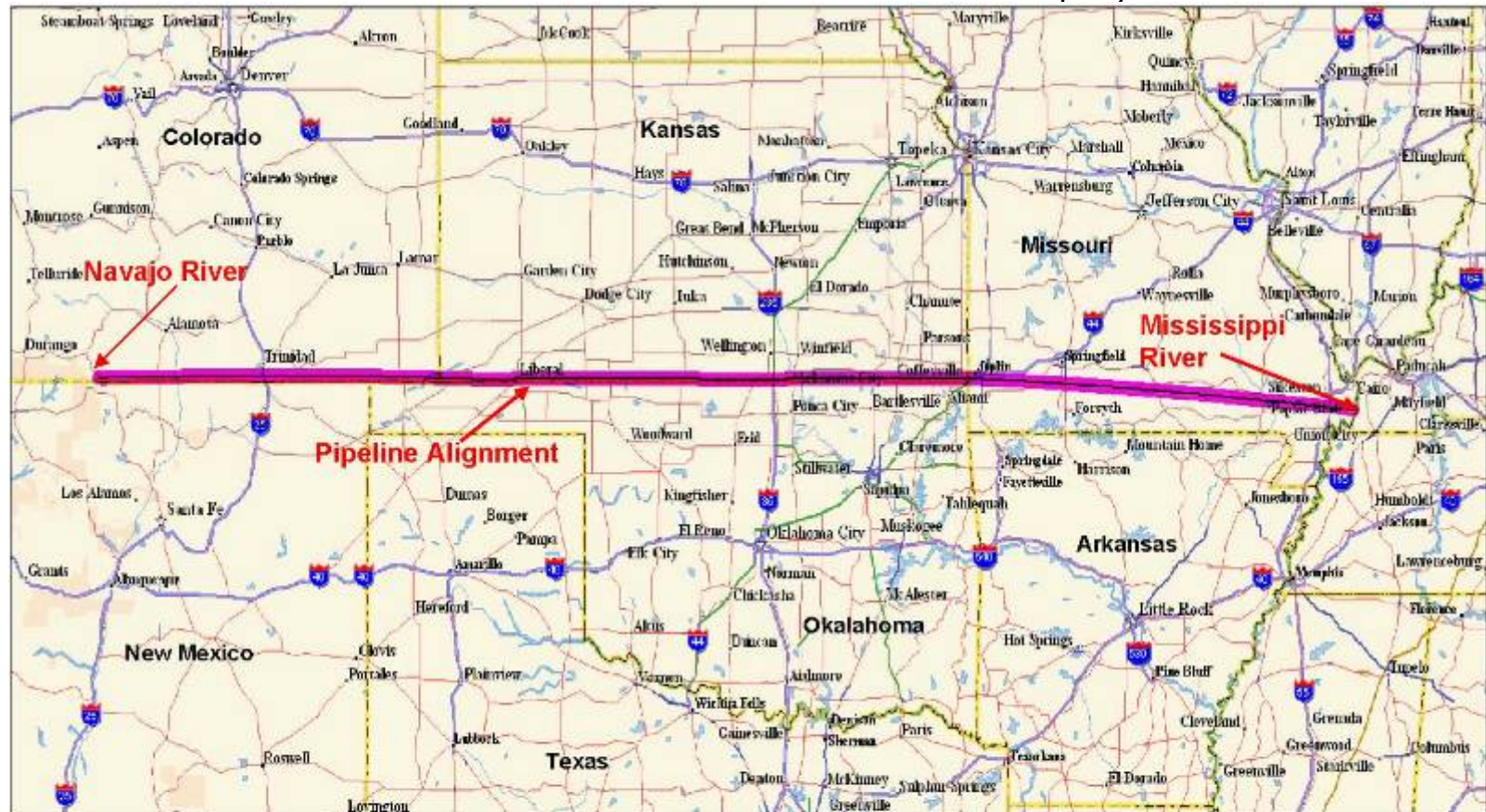
Bear River to Hams Fork Creek

Mississippi River to Navajo River

Transbasin Imports

Mississippi River Diversion

Quantity: 675,000 AFY
Cost: \$1,370 / AF



Approximate Scale

Transbasin Diversions

- Water is available, but within control of states
- Cost is high, but competitive
- Institutional issues are significant



Vegetation Management Location 1: Lower Virgin River

Concept:
Saltcedar removed by
spraying and burning.
Ongoing revegetation and
spraying as needed.

Quantity: 17,000 AFY

Cost: \$100 / AF

Summary of Technical Memoranda



Vegetation Management

Location 2:

Lower Colorado River

Concept:
Saltcedar removed by
leaf beetles.
Ongoing revegetation and
spraying as needed.

Quantity: 154,000 AFY

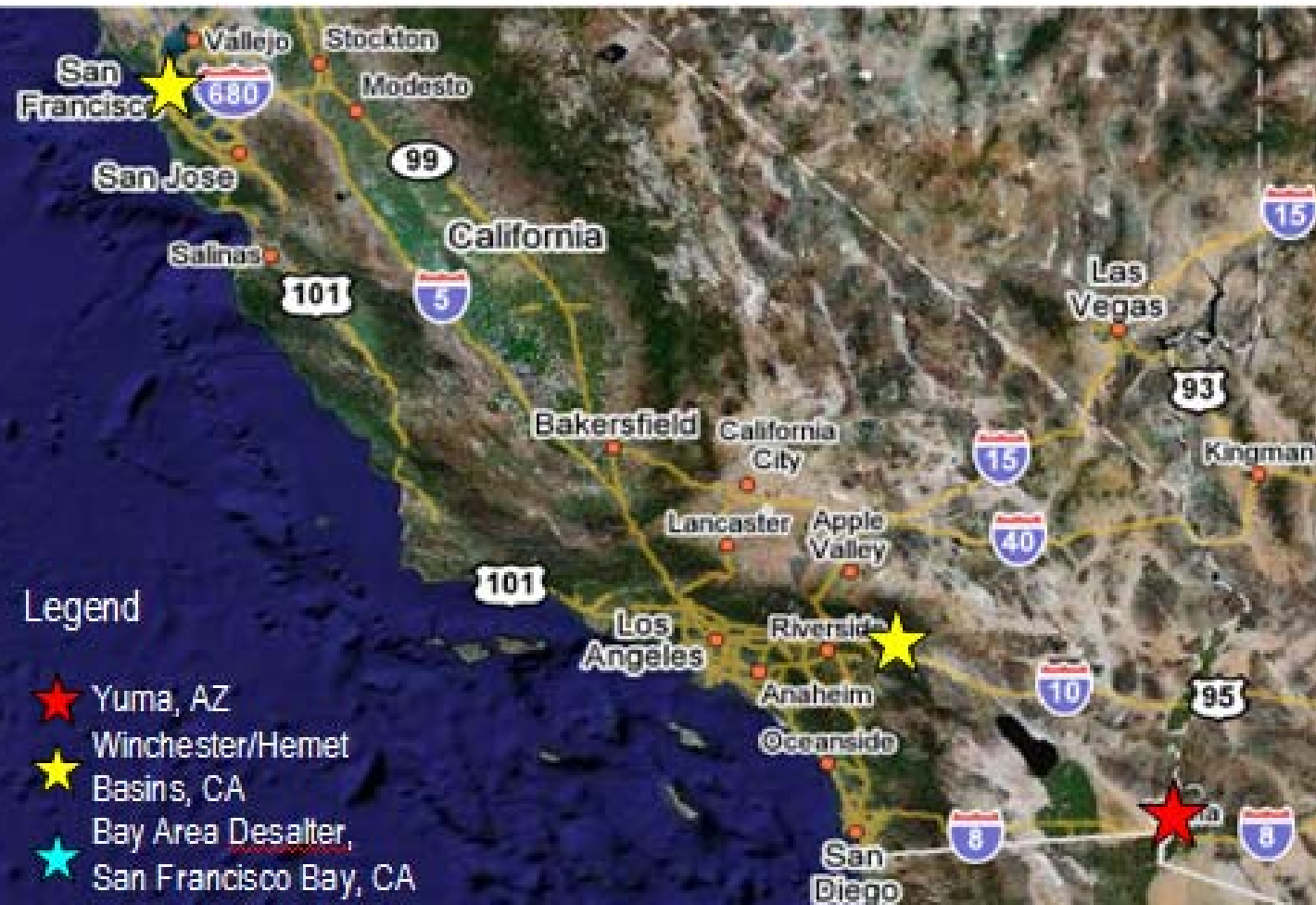
Cost: \$25 / AF

Vegetation Management

- Saltcedar coverage in basin growing from present 300,000 acres to 600,000 acres in 2020.
- Control of saltcedar can yield 3 AF / acre / year
- Annualized control cost is \$25 - \$100 / acre
- Quantification of saved water difficult

Brackish Water Desalination

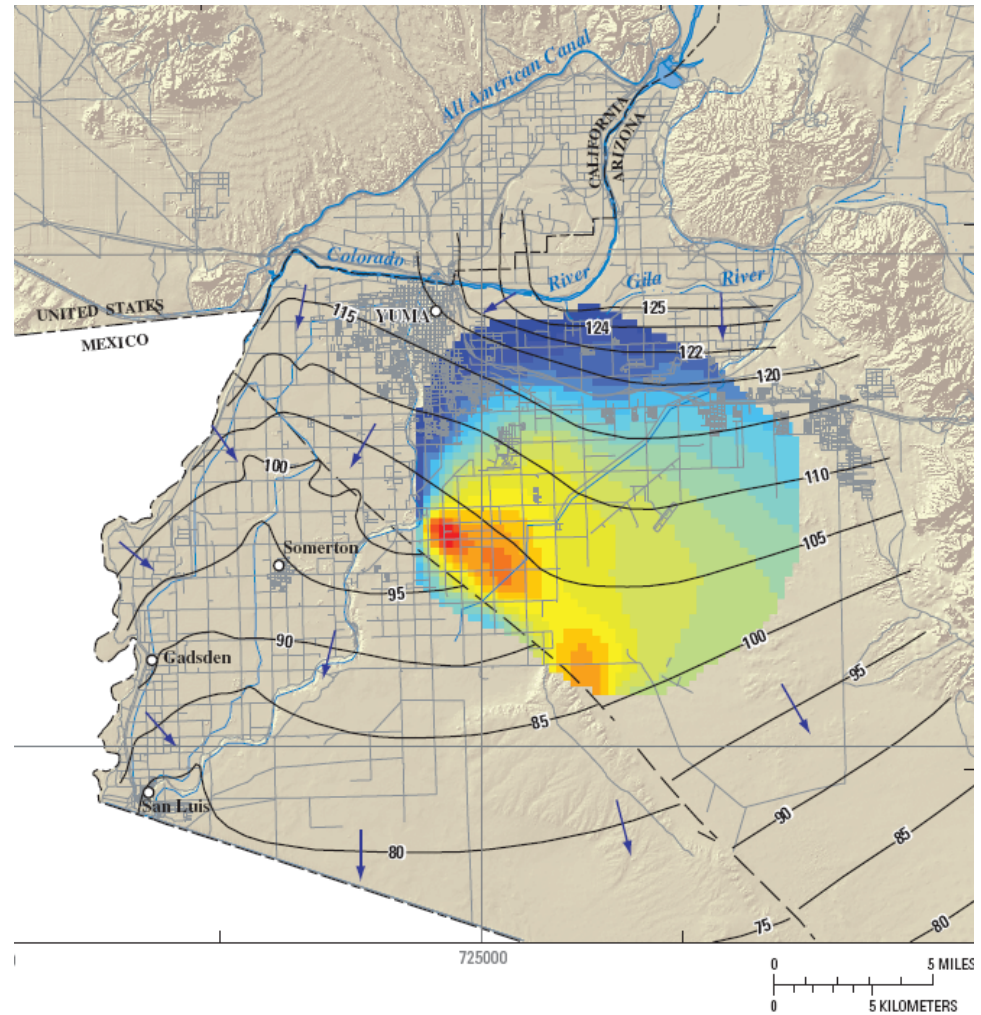
Locations of Brackish Water Desalination Facilities



Brackish Water Desalting Yuma Vicinity



YUMA DESALTER



Brackish Water Desalination General Description

- **Concept**

Treat brackish groundwater to provide new source of supply

- **Quantity**

Yuma – 100,000 AFY

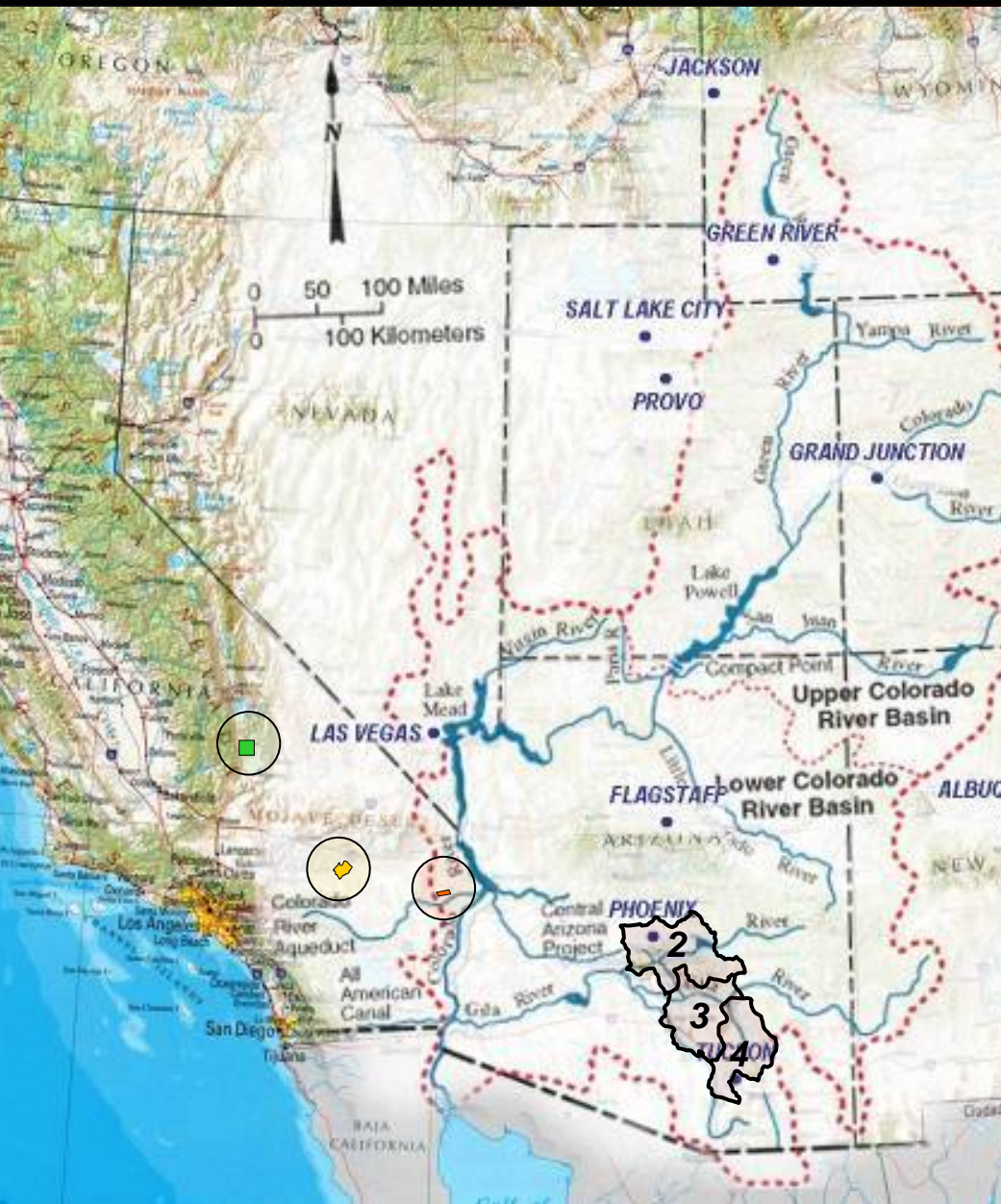
Southern California – 4,000 AFY

Northern California – 40,000 AFY

- **Cost**

\$400 - \$1,900 / AF

Summary of Technical Memoranda



Conjunctive Use Locations

- Semitropic Water Storage District
- Chino Groundwater Basin
- Hayfield Groundwater Storage Project

- 2** Phoenix Active Management Area
- 3** Pinal Active Management Area
- 4** Tucson Active Management Area

Conjunctive Use

- Can add up to 40,000 AFY to supply
- Dependent on availability of surplus water for storage
- Cost ranges from \$350 to \$460 / AF
- Programs and locations are in place for use

Summary of Technical Memoranda



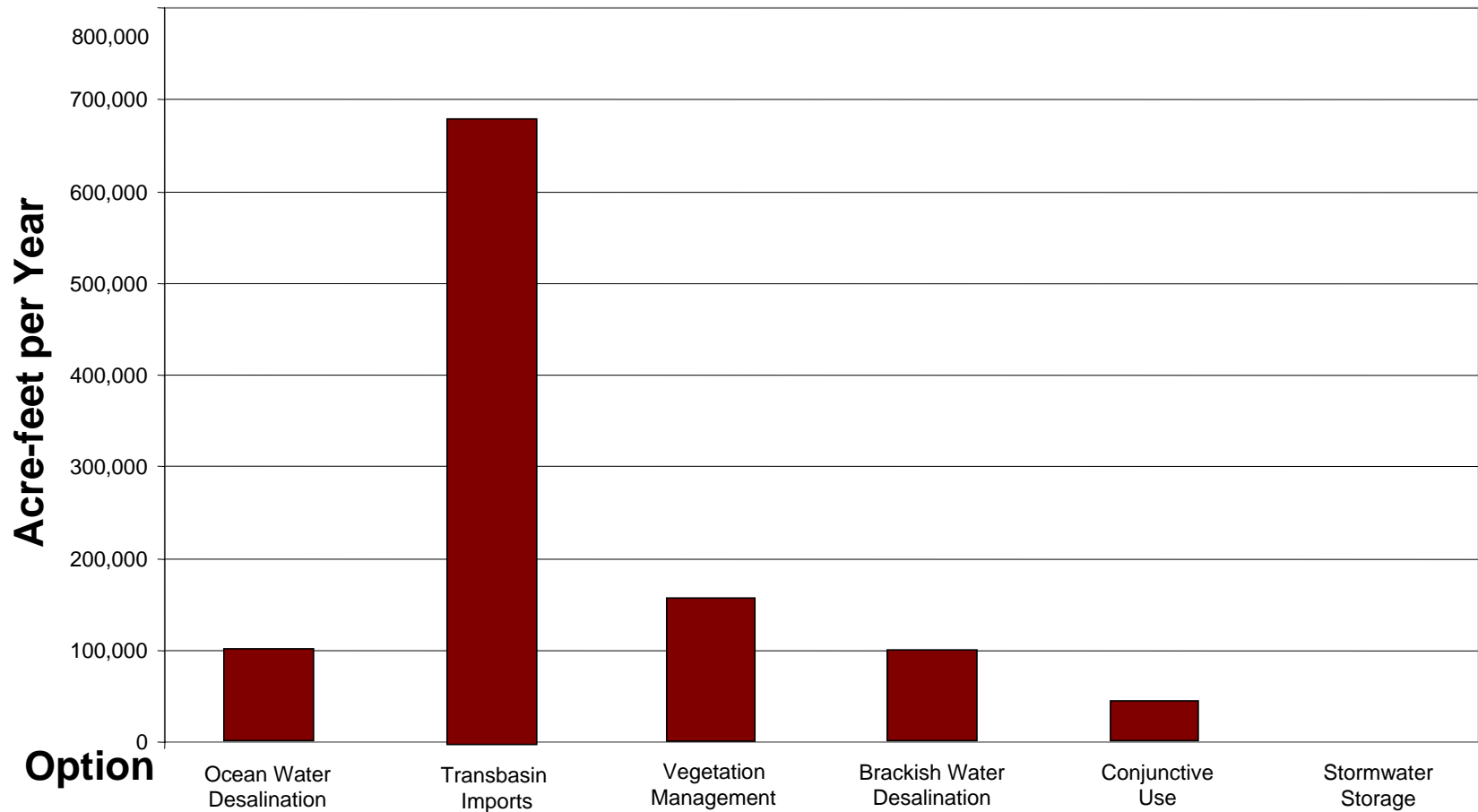
Stormwater Storage Painted Rock Reservoir

Concept:
Store flood flows in
Painted Rock Reservoir,
convey to Imperial Dam
via new control.

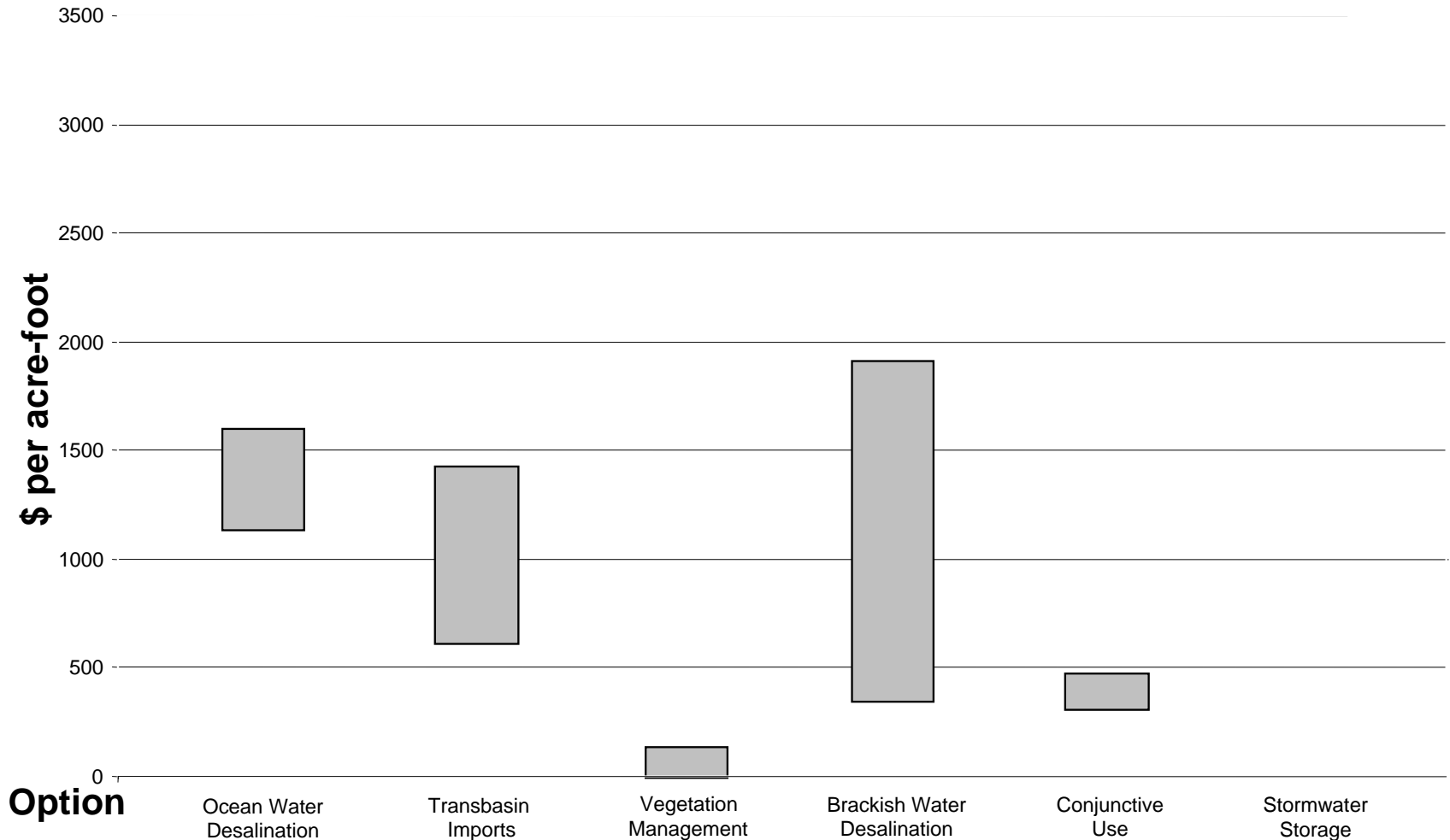
Imperial Dam

Painted Rock Dam

Quantity Comparison of Augmentation Options



Cost Comparison of Augmentation Options



Summary

Proposed Reservoir Operations

- Virgin and Muddy River pre-Compact rights
- Non-system water conveyance
- Development of 75,000 AF of permanent water supply
- Long-term augmentation potential for the Colorado River



I spied it, so it's mine

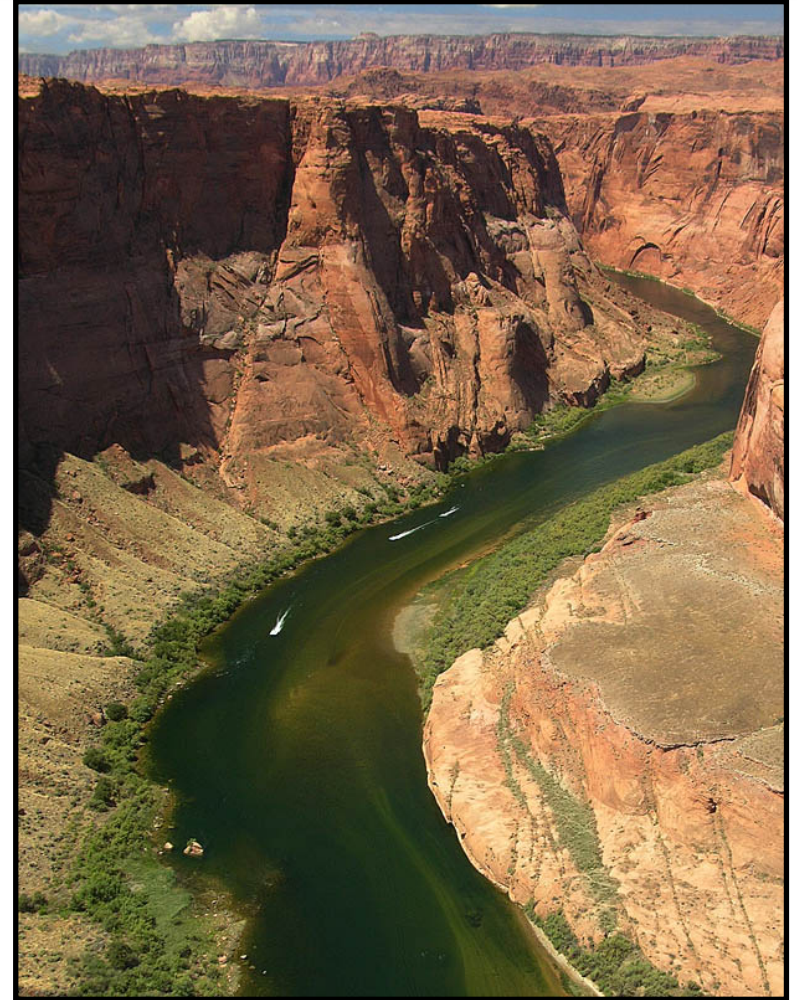


What..., so I use 4.4 mafy



I got your shortage...

The SNWA will continue to work with stakeholders to manage the region's water resources and develop collaborative solutions that will ensure adequate future water supplies.



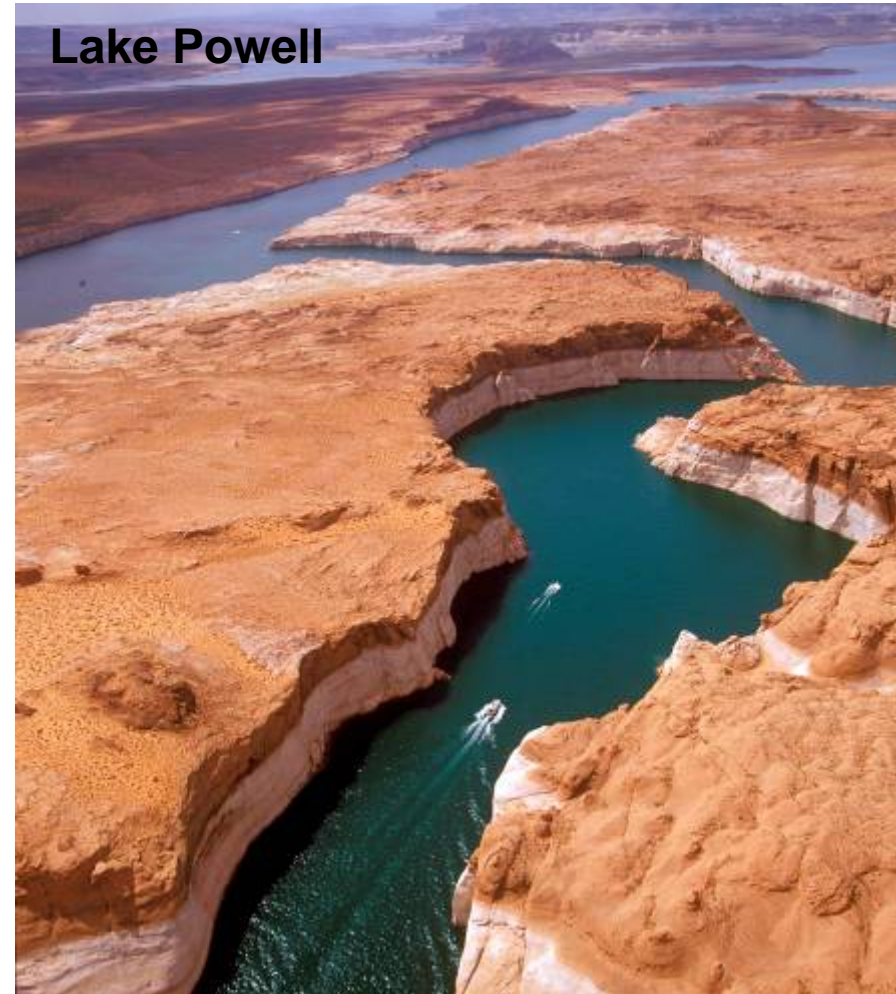
System Storage

	Capacity (Million Acre- Feet)	April 15, 2007 (Million Acre- Feet)	Percent Capacity
Lake Powell	24.3	11.6	47%
Lake Mead	25.7	13.8	54%

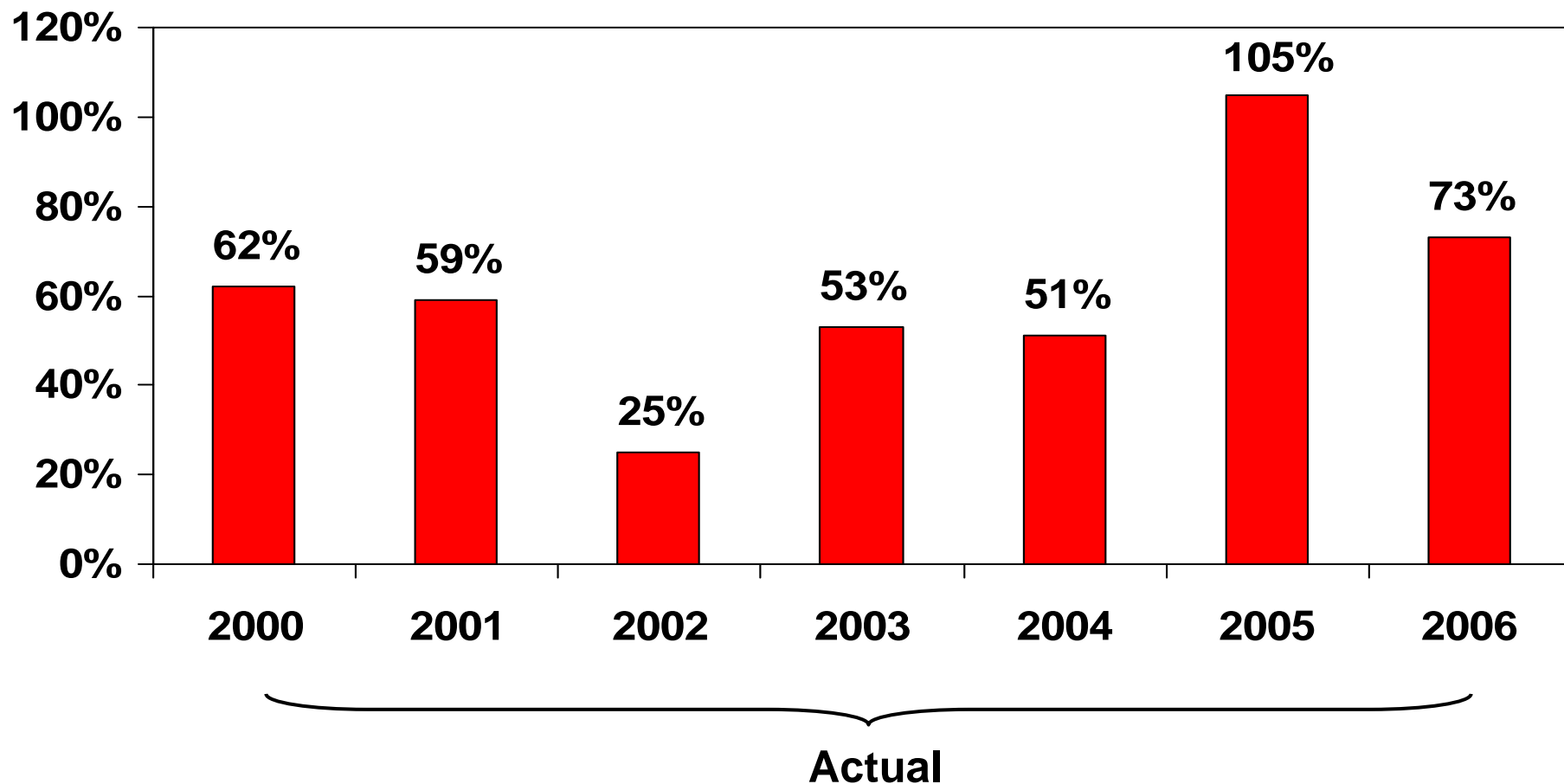
Lake Mead



Lake Powell



Lake Powell Annual Inflows



Historical 7-Year Average Inflow: 61% of normal